European Marine Data Exchange

By
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EU EMODnet Ingestion Coordinator

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Acquisition of ocean and marine data

Data are important for science, governance, and economy
Data acquisition in Europe

- Data are collected by governments, research institutes, and private industry (in Europe more than 1,000 organisations)
- Data for physics, geophysics, meteorology, chemistry, biology, geology, bathymetry
- Acquisition of oceanographic and marine data is expensive; annual costs in Europe estimated at **1.4 Billion Euro** (1.0 = in-situ; 0.4 = satellites)

Professional data management is required with agreements on standardisation, quality control protocols, long term archiving, catalogues, and access.
SeaDataNet pan-European data management infrastructure

National Oceanographic Data Centres (NODCs) and major marine research institutes from 34 countries have been building and operating the SeaDataNet pan-European infrastructure for managing marine and ocean data with co-funding by the European Commission since early 2000.
SeaDataNet portal as ‘one stop shop’

Giving access to

- Standards, tools, and services, for data centres and other users
- Data and metadata
- Products

http://www.seadatanet.org
CDI (Common Data Index) service for discovery and unified data access

At present, 2.15 million CDI entries from 34 countries, 110 data centres and >650 originators for physics, chemistry, geology, geophysics, bathymetry and biology; from 1805 to 2018; 87.6% unrestricted or under SDN License.
From data discovery to unified access and delivery
SeaDataNet cooperation

- **Copernicus Marine Environmental Monitoring Services (CMEMS):** providing long-term archives and standards
- **Marine Strategy Framework Directive (MSFD):** providing infrastructure, standards and data collections for several indicators
- **Large ocean monitoring systems (EuroGOOS, AtlantOS, Euro-ARGO, JERICO-Next, ..):** providing standards and validation + long-term archiving services
- **Ocean Data Interoperability Platform (ODIP):** exploring and demonstrating common standards and interoperability with leading data management infrastructures in USA and Australia
- **GEOSS - EuroGEOSS:** Maintaining the GEOSS portal with SeaDataNet in-situ data collections from large community of European data holders (> 100 data centres; >600 data originators)
- **European Open Science Cloud (EOSC):** shaping the pilot Blue Cloud
- **European Marine Observation and Data Network (EMODnet):** driven by Marine Knowledge 2020 and Blue Growth
SeaDataNet and EMODnet

- EU initiative for an overarching European Marine Observation and Data Network (EMODNet) driven by Marine Knowledge 2020 and Blue Growth

- SeaDataNet qualified as a leading infrastructure for the EMODnet data management component and is driving several thematic portals from the start in 2008

- ‘Bottom-up meets top-down’

- This synergy has resulted in many more data centres adopting SeaDataNet standards and connecting to the CDI Data Discovery and Access service while it gave a flying start to EMODnet
EMODnet thematic portals

**Bathymetry**
- Minimum cell water depth
- Maximum cell water depth
- Average cell water depth
- Standard deviation of cell water depth
- Number of values used for interpolation of cell water depth
- Horizontal coordinate reference system
- Depth reference system
- Lowest Astronomical Tide

**Geology**
- Seabed substrate
- Sediment accumulation rate
- Sea-floor geology
- Seabed lithology
- Stratigraphy
- Coastline migration
- Aggregate resources
- Geological events

**Seabed Habitats**
- Data on modelled seabed habitats (depth, seabed substrate, broad scale biological zone, T, S, light, oxygen, energy due to waves & current)
- Broad-scale physical habitat map
- Detailed habitat maps from surveys
- Individual habitat modelling outputs
- Habitat point data

**Chemistry**
- Pesticides & Biocides
- Antifoulants
- Pharmaceuticals
- Heavy Metals
- Hydrocarbons
- Radionuclides
- Fertilizers
- Acidity
- Dissolved Gasses
- Plastics
- Marine Litter Beach litter Sea floor litter Micro litter
- Chlorophyll Silicates Organic Matter

**Biology**
- Biomass
- Abundance
- Gridded Abundance maps
- species groups:
  - phytoplankton
  - zooplankton
  - angiosperms
  - macro-algae
  - invertebrate bottom fauna
    - birds
    - mammals
    - reptiles
    - Fish

**Physics**
- Waves
- Water temperature
- Water salinity/conductivity/density
- Currents
- Light attenuation/fluorescence
- Sea level
- Atmospheric parameters
- Wind
- Underwater noise
- Rivers
- Ice

**Human activities**
- Aggregate Extraction
- Dredging
- Fisheries
- Hydrocarbon Extraction
- Main Ports
- Mariculture
- Ocean Energy Facilities
- Pipelines and Cables
- Protected Areas
- Waste Disposal
- Wind Farms
- Other Forms of Area Management / Designation

[www.emodnet.eu](http://www.emodnet.eu)
EMODnet Bathymetry portal

Developing and providing a harmonised Digital Terrain Model (DTM) for the European sea regions
Bathymetry – gathered data

> 27,000 survey data sets from 50+ European data providers indexed in the CDI data discovery and access service
New EMODnet DTM released (115 * 115 m²)
3D visualisation in the browser
Source reference map (> 9,400 data sets from 48 data providers used as input)

**WHAT?**
- Data set name
- Discipline
- Parameter groups
- Discovery parameters
- GEMET-INSPIRE themes
- Abstract
- Data format
- Data set creation date

**WHERE?**
- Map

**GML id**

**GML objects**

**Details**

**TEXEL-IJMUIDEN**
- Marine geology
- Terrestrial

**Parameter groups**
- Gravity, magnetics and bathymetry
- Terrestrial

**Discovery parameters**
- Bathymetry and Elevation

**GEMET-INSPIRE themes**
- Oceanographic geographical features

**Abstract**
The Hydrographic Service of the Royal Netherlands Navy informs mariners about shipping routes, the seabed and underwater hazards such as shipwrecks. To this end, the Hydrographic Service compiles nautical charts, carefully details the maritime borders of the Netherlands and carries out depth measurements. The referenced survey is carried out to support these tasks.

**Data format**
- XYZ ASCII  Version 1.0

**Data set creation date**
- 20171218
EMODnet Chemistry

The EMODnet Chemistry portal provides easy access to marine chemical data, standardised harmonized validated data collections and reliable data products, highly relevant to assess ecosystem status according to the Marine Strategy Framework Directive.

www.emodnet-chemistry.eu
EMODnet Chemistry

- Gathers chemistry data sets from research and monitoring activities

- Develops standardized harmonized validated data collections and concentration maps of nutrients (NO₃, PO₄, SiO₄, NOₓ, NH₄, Total N, Total P), chlorophyll a and dissolved oxygen

- Develops long time series of contaminants concentrations

- Develops European databases and maps for marine litter (beach litter, floating litter, and micro litter) cooperating with TG-ML, Regional Sea Conventions, ICES, and others
# EMODnet Chemistry matrix

<table>
<thead>
<tr>
<th>MSFD regions</th>
<th>Baltic Sea</th>
<th>Iberian peninsula - Macaronesia - Bay of Biscay</th>
<th>Greater North Sea - Celtic Sea - Faeroes</th>
<th>Arctic Ocean - Norwegian Sea - Greenland Sea - Barents Sea - Icelandic Waters</th>
<th>Mediterranean Sea</th>
<th>Black Sea - Sea of Azov - Marmara Sea</th>
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</thead>
<tbody>
<tr>
<td>Group of Variables</td>
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<td>Acidity</td>
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<tr>
<td>Antifoulants</td>
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<tr>
<td>Chlorophyll</td>
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<tr>
<td>Dissolved gasses</td>
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<tr>
<td>Fertilisers</td>
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<tr>
<td>Hydrocarbons</td>
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<td>Heavy metals</td>
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<td>Organic matter</td>
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<tr>
<td>Polychlorinated biphenyls</td>
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<tr>
<td>Pesticides and biocides</td>
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<tr>
<td>Radionuclides</td>
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<tr>
<td>Silicates</td>
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</tr>
</tbody>
</table>

Legend - number of measurement data sets for each variable per marine region:
- **1-50**
- **51-250**
- **251-1000**
- **5001-10000**
- **10001-25000**
- **>25000**

water column, sediment and biota
# CDI service in EMODnet Chemistry

## Summary

<table>
<thead>
<tr>
<th>PER CDI PARTNER</th>
<th>Country</th>
<th>Datasets</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Oceanographic Data Centre</td>
<td>United Kingdom</td>
<td>11457</td>
</tr>
<tr>
<td>International Council for the Exploration of the Sea (ICES)</td>
<td>Denmark</td>
<td>5632</td>
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<tr>
<td>German Oceanographic Datacentre</td>
<td>Germany</td>
<td>3322</td>
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<tr>
<td>Rijkswaterstaat Water, Traffic and Environment</td>
<td>Netherlands</td>
<td>2705</td>
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<td>Management Unit of North Sea and Scheidt Estuary Mathematical Models, Belgian Marine Data Centre</td>
<td>Belgium</td>
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<td>Flanders Marine Institute</td>
<td>Belgium</td>
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<tr>
<td>Aarhus University, Department of Bioscience, Marine Ecology Roskilde</td>
<td>Denmark</td>
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<tr>
<td>IFREMER / IDM / SISMER - Scientific Information Systems for the SEA</td>
<td>France</td>
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</tr>
<tr>
<td>Swedish Meteorological and Hydrological Institute</td>
<td>Sweden</td>
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<tr>
<td>BRGM / Office of Geological and Mining Resources</td>
<td>France</td>
<td>163</td>
</tr>
<tr>
<td>All-Russia Research Institute of Hydrometeorological Information - World Data Centre (RIHMI-WDC) National Oceanographic Data Centre (NODC)</td>
<td>Russian Federation</td>
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</tr>
<tr>
<td>PANGAEA - Data Publisher for Earth &amp; Environmental</td>
<td>Germany</td>
<td>44</td>
</tr>
</tbody>
</table>

Heavy Metals in the MSFD North Sea region
Seasonal concentration maps
SeaDataNet as driver and contributing to many portals

Total collection

Data discovery and access

> 110 data centres

NODCs; HO; GEO; BIO; ICES;

> 650 European data originators

CDI Data Discovery and Access service

GEOSS portal

Aggregated collection

Regional subsets

Black Sea portal

Caspian portal

Geo-Seas portal

IODS ODP portal

Total collection

Regional subsets

Thematic subsets

Bathymetry

Physics

Chemistry

Geology

Biology

SeaDataNet as driver and contributing to many portals

CDI Data Discovery and Access service
WaLTER – Wadden Sea portal

https://www.walterwaddenmonitor.org/
Importance of good data management

- The EMODnet added value products are only possible because of a well organised data management which starts at the base.

- The SeaDataNet – EMODnet infrastructure is federated and builds upon data management systems operated by organisations in the different countries.

‘Collect once, use many times for different applications’

- Adopting common standards facilitates exchange and sharing of data.

- Applying **FAIR** principles: Findable, Accessable, Interoperable and Reusable.
Towards a Blue Cloud as blueprint for the European Open Science Cloud (EOSC)

- Cloud platform with common services for data pre-processing, analyses, visualizations, publishing, DOIs...
- Applying common standards and interoperability solutions for providing harmonised data and metadata
- Providing harmonised discovery and access to data output from multiple sources, European and international
EMODnet Ingestion – wake up your data

Welcome to the EMODnet Data Ingestion portal

The European Marine Observation and Data Network (EMODnet) consists of more than 160 organisations that together work on assembling, harmonising and making marine data, products and metadata more available to public and private users. This Data Ingestion portal facilitates additional data managers to ingest their marine datasets for further processing, publishing as open data and contributing to applications for society.

Submit your data files
The online Data Submission service facilitates you to submit marine datasets by completing a form and

Ingest operational data
We are also interested in (Near) Real-Time ((NJRT) data streams from fixed and autonomous ocean

View submissions
View, search and download datasets that have been submitted by data providers using the Data